

Hi-Rel 80 V - 1 A NPN bipolar transistor

Features

BV _{CEO}	80 V
I _C (max)	1 A
H _{FE} at 10 V - 150 mA	> 100
Operating temperature range	-65°C to +200°C

- Hi-Rel NPN bipolar transistor
- Linear gain characteristics
- ESCC qualified
- European preferred part list EPPL
- 100 krad low dose rate
- Radiation level: lot specific total dose contact marketing for specified level



The 2N3700HR is a silicon planar epitaxial NPN transistor in TO-18 and LCC-3 packages. It is specifically designed for aerospace Hi-Rel applications and ESCC qualified according to the 5201-004 specification. In case of conflict between this datasheet and ESCC detailed specification, the latter prevails.

Figure 1. Internal schematic diagram

Co(3)

DS10450

E $\phi(1)$

TO-18 LCC-3

LCC-3UB

Table 1. Device summary

Order codes	ESCC part num.	Qual. level	Rad level	Packages	Lead finish	Mass (g)	EPPL
2N37000UB1	-	Eng. model		LCC-3UB	Gold	0.06	-
2N37000UBSW	5201/004/07	ESCC flight	100 krad	LCC-3UB	Solder dip	0.06	Υ
2N37000UB06	5201/004/06	ESCC flight		LCC-3UB	Gold	0.06	-
2N37000UB07	5201/004/07	ESCC flight		LCC-3UB	Solder dip	0.06	-
SOC37000	-	Eng. model		LCC-3	Gold	0.06	-
SOC3700SW	5201/004/05	ESCC flight	100 krad	LCC-3	Solder dip	0.06	Υ
SOC3700HRB	5201/004/04 or 05	ESCC flight		LCC-3	Gold/Solder dip ⁽¹⁾	0.06	Υ
2N3700T1	-	Eng. model		TO-18	Gold	0.40	-
2N3700HR	5201/004/01 or 02	ESCC flight		TO-18	Gold/Solder dip ⁽¹⁾	0.40	-

^{1.} Depending ESCC part number mentioned on the purchase order

November 2011 Doc ID 15354 Rev 4 1/12

Electrical ratings 2N3700HR

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{CBO}	Collector-base voltage (I _E = 0)	140	V
V _{CEO}	Collector-emitter voltage (I _B = 0)	80	V
V _{EBO}	Emitter-base voltage (I _C = 0)	7	٧
I _C	Collector current	1	Α
P _{tot}	Total dissipation at $T_{amb} \le 25~^{\circ}C$ for 2N3700HR for SOC3700HRB for SOC3700HRB $^{(1)}$ Total dissipation at $T_c \le 25~^{\circ}C$ for 2N3700HR	0.5 0.5 0.76	w w w
T _{stg}	Storage temperature	-65 to 200	°C
TJ	Max. operating junction temperature	200	°C

^{1.} When mounted on a 15 x 15 x 0.6 mm ceramic substrate.

Table 3. Thermal data for through-hole package

Symbol	Parameter	TO-18	Unit
R _{thJC}	Thermal resistance junction-case max	97	°C/W
R_{thJA}	Thermal resistance junction-ambient max	350	°C/W

Table 4. Thermal data for SMD package

Symbol	Parameter	soc	Unit
R _{thJA}	Thermal resistance junction-ambient max	350	°C/W
R_{thJA}	Thermal resistance junction-ambient ⁽¹⁾ max	230	°C/W

^{1.} When mounted on a 15 x 15 x 0.6 mm ceramic substrate.

2 Electrical characteristics

 T_{case} = 25 °C unless otherwise specified.

Table 5. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
Ісво	Collector cut-off current (I _E = 0)	V _{CB} = 90 V V _{CB} = 90 V T _{amb} = 110 °C V _{CB} = 90 V T _{amb} = 150 °C			10 100 10	nA nA μA
I _{EBO}	Emitter cut-off current (I _C = 0)	V _{EB} = 5 V			10	nA
V _{(BR)CBO}	Collector-base breakdown voltage (I _E = 0)	I _C = 100 μA	140			V
V _{(BR)CEO} (1)	Collector-emitter breakdown voltage (I _B = 0)	I _C = 30 mA	80			V
V _{(BR)EBO}	Emitter-base breakdown voltage (I _C = 0)	I _E = 100 μA	7			V
V _{CE(sat)} (1)	Collector-emitter saturation voltage	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$ $I_C = 500 \text{ mA}$ $I_B = 50 \text{ mA}$			0.2 0.5	V V
V _{BE(sat)} (1)	Base-emitter saturation voltage	$I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$ $I_C = 150 \text{ mA}$ $I_B = 15 \text{ mA}$ $T_{amb} = 110 \text{ °C}$	0.75 0.65	0.87	0.9	V V
h _{FE} ⁽¹⁾	DC current gain	$\begin{split} & I_{C} = 10 \text{ mA} & V_{CE} = 10 \text{ V} \\ & I_{C} = 150 \text{ mA} & V_{CE} = 10 \text{ V} \\ & I_{C} = 500 \text{ mA} & V_{CE} = 10 \text{ V} \\ & I_{C} = 150 \text{ mA} & V_{CE} = 10 \text{ V} \\ & T_{amb} = -55 \text{ °C} \end{split}$	90 100 50 40		300	
h _{fe}	Small signal current gain	$V_{CE} = 10 \text{ V}$ $I_{C} = 50 \text{ mA}$ $f = 20 \text{ MHz}$	5			
C _{CBO}	Output capacitance (I _E = 0)	V _{CB} = 10 V f = 1 MHz			12	pF
C _{IBO}	Input capacitance (I _C = 0)	$V_{EB} = 0.5 \text{ V}$ f = 1 MHz			60	pF

^{1.} Pulsed duration = 300 $\mu s,\,duty\,\,cycle \leq\,2~\%$

Electrical characteristics 2N3700HR

2.1 Electrical characteristics (curves)

Figure 2. DC current gain Figure 3. DC current gain $(V_{CE}=1\ V)$ $(V_{CE}=10\ V)$

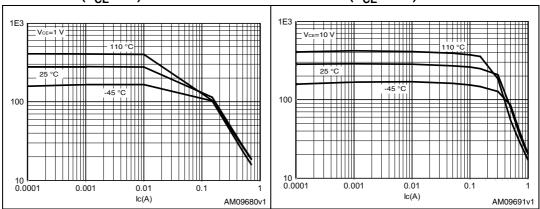
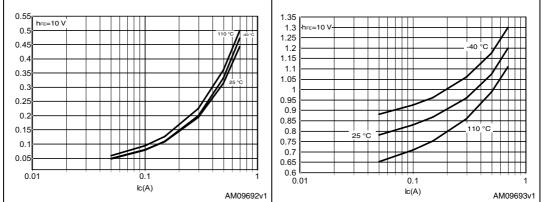


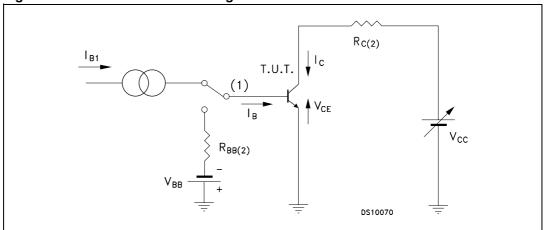
Figure 4. Collector emitter saturation Figure 5 voltage

Figure 5. Base emitter saturation voltage



2.2 Test circuit

Figure 6. Resistive load switching test circuit



- 1. Fast electronic switch
- 2. Non-inductive resistor

3 Package mechanical data

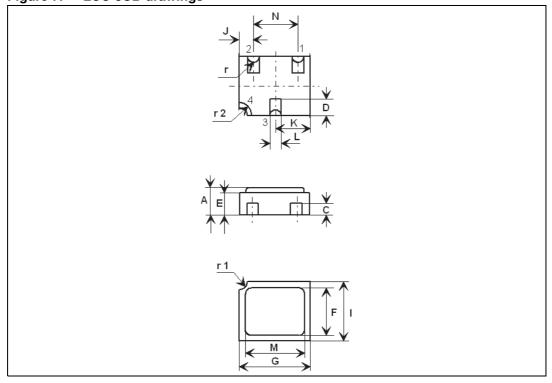
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6/12 Doc ID 15354 Rev 4

Table 6. LCC-3UB mechanical data

Dim.		mm.				
Dilli.	Min.	Тур.	Max.			
А	1.16		1.42			
С	0.46	0.51	0.56			
D	0.56	0.76	0.96			
E	0.92	1.02	1.12			
F	1.95	2.03	2.11			
G	2.92	3.05	3.18			
I	2.41	2.54	2.67			
J	0.42	0.57	0.72			
К	1.37	1.52	1.67			
L	0.41	0.51	0.61			
М	2.46	2.54	2.62			
N	1.81	1.91	2.01			
r		0.20				
r1		0.30				
r2		0.56				

Figure 7. LCC-3UB drawings



577

Table 7. LCC-3 mechanical data

Dim	mm.				
Dim.	Min.	Тур.	Max.		
Α	1.16		1.42		
С	0.45	0.50	0.56		
D	0.60	0.76	0.91		
E	0.91	1.01	1.12		
F	1.95	2.03	2.11		
G	2.92	3.05	3.17		
I	2.41	2.54	2.66		
J	0.42	0.57	0.72		
К	1.37	1.52	1.67		
L	0.40	0.50	0.60		
M	2.46	2.54	2.62		
N	1.80	1.90	2.00		
R		0.30			

Figure 8. LCC-3 drawings

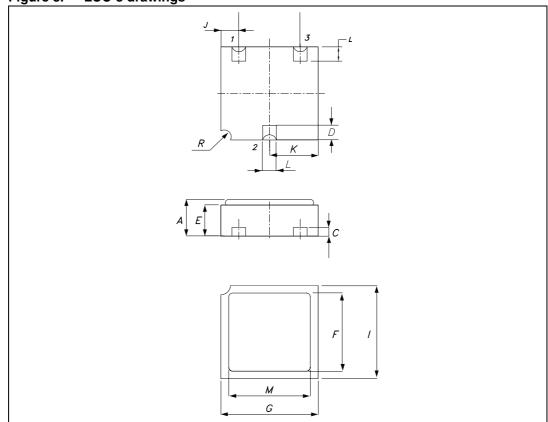
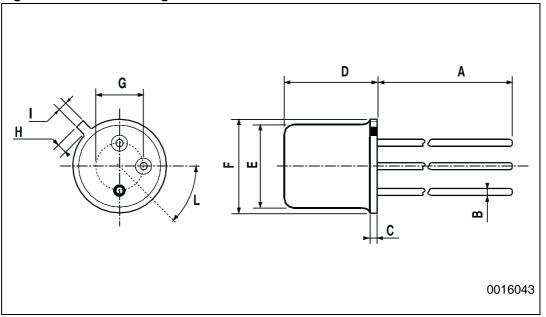


Table 8. TO-18 mechanical data

Dim.	mm.					
Dilli.	Min.	Тур.	Max.			
А		12.7				
В			0.49			
D			5.3			
E			4.9			
F			5.8			
G	2.54					
Н			1.2			
I			1.16			
L	45°					

Figure 9. TO-18 drawings



Order codes 2N3700HR

4 Order codes

Table 9. Order codes

Order codes	ESCC Part number	Rad level	Packages	Lead Finish	Marking	EPPL	Packing
2N37000UB1	-		LCC-3UB	Gold	2N37000UB1	-	Waffle pack
2N37000UBSW	5201/004/07	100 krad	LCC-3UB	Solder Dip	520100407	Υ	Waffle pack
2N37000UB06	5201/004/06		LCC-3UB	Gold	520100406	-	Waffle pack
2N37000UB07	5201/004/07		LCC-3UB	Solder Dip	520100407	-	Waffle pack
SOC37000	-		LCC-3	Gold	SOC3700	-	Waffle pack
SOC3700SW	5201/004/05	100 krad	LCC-3	Solder Dip	520100405	Υ	Waffle pack
SOC3700HRB	5201/004/04 or 05		LCC-3	Gold or Solder Dip ⁽¹⁾	520100404 or 05	Y	Waffle pack
2N3700T1	-		TO-18	Gold	2N3700T1	-	Strip pack
2N3700HR	5201/004/01 or 02		TO-18	Gold or Solder Dip ⁽¹⁾	520100401 or 02	-	Strip pack

^{1.} Depending ESCC part number mentioned on the purchase order

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2N3700HR Revision history

5 Revision history

Table 10. Document revision history

Date	Revision	Changes
10-Jan-2008	1	Initial release
07-Jan-2010	2	Modified Table 1 on page 1
26-Jul-2010	3	Modified Table 1 on page 1, added Table 9 on page 10
30-Nov-2011	4	 Modified: Table 5 on page 3 Added: Section 2.1: Electrical characteristics (curves) Minor text change in the document title on the coverpage

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12/12 Doc ID 15354 Rev 4